

A CASE OF DISPUTED ORTHOGRAPHY: IS IT *ECHINOCHLOA COLONA*; OR IS IT *ECHINOCHLOA COLONUM* (GRAMINEAE)?

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ABSTRACT

Within the genus *Echinochloa* (Gramineae) the epithet of the grass familiarly known as Jungle Rice has been spelled either "*colona*" or "*colonum*." Linnaeus, in his original recognition of the species as a member of the neuter genus *Panicum*, chose "*colonum*" as the epithet. This word, from the Latin "*colonus*," is a noun. As such, under the International Code of Botanical Nomenclature it must retain its original spelling whatever the gender of the genus to which it may be assigned. The grass is thus correctly known as *Echinochloa colonum* (L.) Link.

RESUMEN

Dentro del género *Echinochloa* (Gramineae), el epíteto de la especie conocida comúnmente como Arroz Salvaje ha sido escrito tanto "*colona*" como "*colonum*." Linnaeus, en su reconocimiento original de la especie como miembro del género neutro *Panicum*, escogió "*colonum*" como epíteto. Esta palabra, del latín "*colonus*," es un sustantivo. En sí, bajo el Código Internacional de Nomenclatura Botánica, debe conservar su ortografía original, cualquiera que sea el género (masculino, femenino, o neutro) del género al que sea asignado. Así pues, el nombre correcto de la especie es *Echinochloa colonum* (L.) Link.

INTRODUCTION

The Old World grass known as Jungle Rice, a member of the genus *Echinochloa* (Gramineae), is now found in tropical and temperate areas throughout the world. Though in ancient times and into the early 20th century it served as an edible grain, it is now best known as a secondary forage for cattle or as a troublesome weed of wet soils. It was given scientific recognition in the mid-18th century, first as a species of *Panicum*, then as a member of the newly formed genus *Echinochloa*. In these two genera it has borne only a single specific epithet. Yet over the decades different authors, with about equal frequency, have given this epithet two spellings—*colona* and *colonum*. But few have attempted to explain their chosen spelling. And none have provided adequate justification of which spelling is correct.

HISTORY

Jungle Rice—a common name of relatively recent origin—has been known from ancient times. The grains have been found in the intestines of mummies of early Egypt, where their amount and purity make it "most probable that the plant

was cultivated as a cereal" (Tackholm & Drar 1941). Its use as a foodstuff in India continued to be documented into the 20th century (Gamble 1928; Bor 1968). The plant was recorded and illustrated by at least three pre-Linnaean authors: Plukenet (1692), Sloane (1696, 1707), and Ehret (1748).

When Linnaeus (1759) published *Panicum colonum* he transcribed the epithet wholly in lower case. His diagnosis of the new species read: *P. spiculis alternis secundis muticis ovatis scabris, rachi teretiuscula*. He referred to the illustrations of both Sloane (1707) and Ehret (1748). His basis may have been a specimen (LINN 80.23; Savage 1945) now in the Linnaean Herbarium obtained from the Irish physician, Patrick Browne, who returned to England in 1756 after a stay in Jamaica (Stafleu 1971); the sheet bears a "Br" in Linnaeus' hand. He may also have seen material in the Jamaica collections of Sir Hans Sloane whom he visited in 1736 (Stearn 1957:110), and was certainly familiar with the plate in Sloane's (1707) book. The plant's relatively distinct morphology, which matches the Sloane and Ehret plates, has made a secure linkage with Linnaeus' diagnosis and name; no later author has questioned the accuracy of their application to the grass known as Jungle Rice.

Panicum is a genus of great size, recently estimated (Mabberley 1996) to contain more than 500 species. It would be even larger if certain groups of species had not been removed as deserving of independent generic rank. *Echinochloa* was among the first of these distinctive groups to be given generic standing, by Beauvois (1812), to contain the familiar Barnyard-grass, *E. crusgalli* (L.) Beauv. Beauvois at the same time formed a second generic segregate, *Oplismenus*. Kunth (1816) then made a transfer of *Panicum colonum*, to form *Oplismenus colonus* (L.) HBK.; and Link (1833) published the now-universally accepted combination (if not spelling), *Echinochloa colona* (L.) Link.

Floristic botanists were slow to accept the new combinations. Influential writers throughout the 19th century—Hooker (1897) and Cooke (1908) in India; Grisebach (1864) in the West Indies; Nash (in Britton & Brown 1898), Chapman (1897), and Mohr (1901) in North America—continued to employ *Panicum colonum*. [Nash (1898), under Britton's editorial edict that all species must have common names, is the apparent originator of the now widely used "Jungle Rice."] Perhaps Merrill (1923) was the last important author to retain Linnaeus' *P. colonum*.

Other than its initial formation, the first significant use of Linnaeus' epithet in the segregate genus *Echinochloa* appears to have been by Nash (in Small's "Flora of the Southeastern United States" 1903), who chose to follow Link (1833) in forming the epithet as "*colona*." Nash seized a second opportunity to promote this spelling by his authorship of the grasses in Britton and Brown (1913), expanding the usage into northeastern North America. The practice received further approbation by Hitchcock (1909) in Cuba; by Stapf (in Prain 1920) and Hutchinson and Dalziel (1936) in Africa; by Gamble (1928) in India; by Hitch-

cock (in Small's "Manual of the Southeastern Flora" 1933); and by Rozhevits and Shishkin (1934) in Russia.

But opposition began to arise to the burgeoning use of *colona*. Hitchcock (who in his earlier works had employed *colona*) noted (1913): "Dr. E.L. Greene called attention to the fact that the specific name is not an adjective, and suggested that it is probably a genitive plural. The word appears to be contracted from *colonorum*, genitive plural of *colonus*, a husbandman or a colonist. Dr. J.A. Nieuwland has kindly searched Latin authorities and verifies this conclusion, though there appears to be no direct authority for the word *colonom*."

Wiegand (1921)—other than Hitchcock, the only author expressing an opinion who had devoted significant time to the taxonomy of *Echinochloa*—observed: "Hitchcock, following Greene, has called attention to the fact that the name *colonom* is not an adjective and hence should not be declined." And Bor (1960), perhaps irritated by the use of *colona* without explanation by other authors addressing the flora of India, brusquely commented: "The correct form of the specific epithet is *colonom*, a contraction of *colonorum*, and not *colona*."

Argument in defense of *colona* was slow to appear. Clayton (in Hepper 1968) may have been the first: "The declension of the epithet depends on whether it is regarded as a noun or an adjective. Lexicographers differ, but the adjectival use was acceptable to those of Linnaeus' own time." This explanation was expanded by Cope (in Nasir & Ali 1982): "The epithet is sometimes treated as the irregular genitive plural of a noun ('of the farmers') and spelt *colonom*. However, there seems no reason to depart from the adjectival form familiar to botanists; though not in the purest classical tradition, its use was sanctioned by lexicographers of Linnaeus' own time." Though citing as his authority an author who had taken the contrary view, Michael (2003) justified *colona*: "Hitchcock (1913) considered that '*colonom*' was a non-declining contraction, but dictionaries of Linnaeus' time treated it as a declining adjective. Because Linnaeus was the first to name the species (as '*Panicum colonum*'), it seems best to follow the practice considered correct in his day; hence '*E. colona*'."

Only these six authors have been found who expressed a justification for their use of either *Echinochloa colona* or *E. colonum*. The many others either held no opinion or gave none in their floristic writings. The three most detailed North American studies—Hitchcock 1920; Wiegand 1921; Gould et al. 1972—all used *colonom*, though only Hitchcock and Wiegand provided justification of the spelling. Two world-scale compilations of plant names (Uphof 1968; Mabberley 1996) pointed in opposite directions. Two comprehensive listings of plant names for temperate North America (Shetler & Skog 1978; Kartesz 1994) similarly differed in their spelling of the epithet. A recent and influential inventory of plants of economic importance worldwide (Wiersema & Leon 1999) chose *colona*.

A cursory survey of floristic authors addressing *Echinochloa* has shown

that in the 20th century (and into the 21st) there is rough equivalence to the two positions; 36 have used *E. colona*, while 43 have used *E. colonum*.

Authors who have employed *Echinochloa colona*: Acevedo-Rodriguez (1996), Allen (1992), Balick, Nee and Atha (2000), Britton and Brown (1913), Clayton and Renvoize (1982, 1986), Clewell (1985), Dassanayake et al. (1994), Diggs et al. (1999), Duncan and Kartesz (1981), Gamble (1928), Gibbs Russell et al. (1991), Gould (1975), Green (1985), Hepper (1968), Hitchcock (1909), Howard (1979), Hutchinson and Dalziel (1936), Jones et al. (1997), Maire (1952), Michael (2003), Nasir and Ali (1982), Prain (1920), Robinson and Fernald (1908), Rozhevits and Shishkin (1934), Small (1903, 1933), Stace (1997), Stevens et al. (2001), Thulin (1995), Turner et al. (2003), Wagner et al. (1990), Watson and Dallwitz (1992), Wofford and Kral (1993), Wunderlin (1998), Zuloaga et al. (2003).

Authors who have employed *Echinochloa colonum*: Adams (1972), Backer (1968), Blomquist (1948), Bor (1960, 1968), Britton and Millspaugh (1920), Correll and Correll (1982), Correll and Johnston (1970), Davis (1985), Fernald (1950), Gleason (1952), Gleason and Cronquist (1963), Godfrey and Wooten (1979), Hall (1978), Hatch et al. (1990), Hitchcock (1913, 1920, 1931, 1935, 1936), Hitchcock and Chase (1917, 1951), Hodge (1954), Li et al. (1978), Maheshwari (1967), Proctor (1984), Pulle (1966), Radford et al. (1968), Rechinger (1964, 1971), Robyns and Tournay (1955), Saldanha and Nicolson (1976), Shouliang (1990), Srivastava (1976), Standley (1937), Steyermark (1963), Swallen (1955), Tackholm and Drar (1941), Terrell (1977), Tutin et al. (1980), Walker (1976), Wiggins (1980), Zangheri (1976).

But correct orthography, as in other more obvious niches of plant taxonomy, is not governed by popular vote, but by conformation to codified rules. Though rules are difficult to understand, sometimes treacherous to follow, they are the only path to consistent usage.

DISCUSSION

Orthography is "the art of spelling words according to accepted usage" (Random House 1979). In taxonomic parlance, "accepted usage" is defined by the rules of the International Code of Botanical Nomenclature (Greuter et al. 2000). In the present instance, the determination of whether *colona* or *colonum* is correct is decided by interpretation and application of Article 23, the Names of Species. It is critical to determine whether the word was first used as an adjective, or as a noun. Resolution of these alternatives requires that there be understanding of the origin of the word and its use in the naming of Jungle Rice.

Colonus was a term used in the late Roman Empire for a worker who was bonded to the farmland of a wealthy landowner; though technically not a slave, the worker was not free to seek employment elsewhere. (This practice later became the coerced labor of the middle-age feudal system.) The word *colonus* is a second declension Latin noun; it is masculine. It is often translated as "free-born serf," or at times as "husbandman," a now-obsolete term surviving only as "animal husbandry," the care and raising of agricultural animals. Occasionally it is read as "farmer" or as "*colonist*," in recognition of the modern inapplicability of the original meaning.

Latin is a highly inflected language (Stearn 1983), that is, the ending of each word indicates the case, number, and gender. *Colonus* is the nominative

singular, *colonum* the accusative singular, *coloni* the genitive singular, *colonorum* the genitive plural, etc. Were a Roman to observe, "The *colonus* kicks the horse" (or *equus*, also a second declension noun), he would say, "*Colonus equum calcitat*." Were the horse to do the kicking, the expression would be, "*Equus colonum calcitat*." If the horse kicks more than one person, "*Equus colonos calcitat*."

In common practice the word *colonus* had no feminine ending, that is, there appears to have been no widely used *colona* in the Latin language (Lewis & Short 1879). That spelling appears to be recorded only twice in the ancient writings (by Ovid). Just as in "horse" (where "mare" indicates the female), the feminine gender most often would have been expressed by a separate word or disregarded entirely. Similarly, there cannot be a neuter *colonum* in the nominative; the structure of the language may appear to permit it, but the concept of a "neuter" worker would be without meaning.

Moreover, there is no adjective *colonus* (or *colona* or *colonum*) in the Latin language. It seems most improbable that "dictionaries of Linnaeus' time treated it as a declining adjective" (Michael 2003). Indeed, were *colonus* treated as an adjective, the word would be unintelligible when translated into English ("free-born serf"?).

The statements by the six authors who gave reasons for their use either of *colona* or *colonum* need examination. All were brief, some cryptic, and some misleading or erroneous. The three who spoke for continued use of *colonum* (Hitchcock 1913; Wiegand 1921; Bor 1960) clearly understood the word to be a noun (the wording of Hitchcock and of Wiegand: "not an adjective"). They erred, perhaps, in that each seemed to assume his readers would properly interpret this fact to require retention of the original spelling. Two spoke of the word *colonum* being a contraction of *colonorum*; this remark is unneeded in that, while *colonorum* is available (the genitive plural of *colonus*), *colonum* is itself a perfectly good form (the accusative singular), thus requiring no "contraction."

Nieuwland, as quoted by Hitchcock (1913), raised a further detail, that "there appears to be no direct authority for the word *colonum*." There indeed seems to be no documented *colonum* in classical Latin (Lewis & Short 1879). Nieuwland's point may be that he believed proper taxonomic style calls for use only of Latin words known to be recorded in surviving Latin writings. Yet, once recognized as a second declension noun, the word *colonus* implies appropriate spellings in other number and case.

The three authors who spoke for changing the spelling to *colona* (Clayton 1968; Cope 1982; Michael 2003) are more difficult to understand. The claim that lexicographers "of Linnaeus' own time" accepted *colona* (Clayton, paraphrased by Cope and Michael) is made without documentation, and no such lexicographic treatment has been seen (the usage by Ovid perhaps excepted). Most significantly, all three state or indicate that they believe the word *colonus* may

be treated as an adjective and thus altered in spelling to agree with the associated genus, perhaps without comprehending that such action must carry them outside the parameters of acceptable Latin.

Linnaeus did not employ the epithet elsewhere than in 1759. The word *colonus*, however spelled, appears to be found in post-Linnaean technical botanical literature only in application to the grass described by Linnaeus (Google, Nov 2003). There are thus no guiding examples of its use with other genera by other authors.

The pathway is indirect by which Linnaeus probably came to use this word for his epithet. The references he cited lack the word: *colonum* does not appear in the phrase-names accompanying the plates of Sloane (1707) nor Ehret (1748), nor in Sloane's (1696) more extensive text. But Sloane (1696)—though this publication was not cited by Linnaeus—referred to a still-earlier publication: Plukenet (1692). There, under a drawing that may be the first illustration of Jungle Rice, and accompanied by a phrase name (*Gramen panicum minus, spica divulsa*) cited by Sloane, Plukenet noted his plant to be "*Pestis Coloni*," or "plague of the farmer." Plukenet's work was well known to Linnaeus, and it is most probable that this phrase (*Coloni*, here, in the genitive singular) was the inspiration for his selection of "*colonum*."

APPLICATION TO BOTANY

Classical Latin, of course, is not the same as botanical Latin (Stearn 1983). The use of Latin as an international language, a practice of the past 250 years, is relatively rigid, with many words given precise meanings unknown to the Roman writer or scholar. These meanings may originate, not with their classical use, but with the application to a botanical situation, as determined by the Recent author who needs a special term for a special structure.

If the term is employed, not just for descriptive purposes, but for a botanical name, the author's latitude is without limit. It is generally recognized that good style encourages an author to use a term or combination of terms, from Latin or Greek, that closely track classic usage. But, encouragement aside, there is no requirement in the Code (Greuter et al. 2000) that the word (or words) used in forming a name be appropriate, or that it be spelled correctly, or that it have any meaning whatsoever.

A provision of the Code (Art. 23.1; Greuter et al. 2000) would appear to restrict this latitude: "The name of a species is a binary combination consisting of the name of the genus followed by a single specific epithet in the form of an adjective, a noun in the genitive, or a word in apposition..." *Colonum*, though accusative, is used in apposition. But the near-simultaneous permission (Art. 23.2) that an epithet "may even be formed arbitrarily" does allow, by modern rules, deviation from strict nominative structure for a word used in apposition.

Thus Linnaeus, though writing far in advance of the modern rules, still falls within their parameters.

It was common practice for Linnaeus (1753, et seq.) to select as the epithet for his new name a word pre-existing in the medieval botanical literature. Many of these words, perhaps most, were adjectives. But others were nouns—known as substantives—and are carried over unchanged into modern botanical usage. Until the mid 20th century many authors indicated the substantive origin of epithets by retaining a capital letter at the beginning of each epithet so formed. Now, though capitalization of substantives is still permitted, the majority of authors de-capitalize epithets, giving uniformity to the structure of names, but obscuring the history and the original usage of the epithet.

Nouns used for epithets are treated differently from adjectives. Adjectives must agree (in case, number, and gender) with the genus to which they are attached, and this agreement is indicated by the requisite change in spelling. In contrast, the Code (Art. 23.5; Greuter et al. 2000) mandates that a noun retains its own gender and ending irrespective of the gender of the generic name.

An example lies near at hand, of a noun used as an epithet and transferred, without change in spelling, to a genus of another gender. Linnaeus (1753) also described and named the plant now commonly known as Barnyard-grass; he termed it *Panicum Crusgalli*. (“Crusgalli” is literally translated as “chicken’s leg,” but is usually interpreted to mean “cock’s-spur.”) When transferred to *Echinochloa* by Beauvois, it became *E. crusgalli* (in modern, preferred usage). Though Linnaeus did not indicate the source of this epithet, his use of a capital initial letter designated it as a substantive. No subsequent author has attempted to treat it as an adjective and adjust the original spelling so as to agree with the gender of the new genus.

Linnaeus’ *Panicum colonum* was received differently. In the masculine genus *Oplismenus*, Kunth (1816) recorded it as *O. colonus*. In the feminine genus *Echinochloa*, Link (1833) stated it to be *E. colona*. The arguments so weakly presented for treating *colonum* as an adjective would perhaps have been strengthened had their proponents noted that the originators of these segregate genera had done so also. Had Clayton (1968) referred to botanists rather than lexicographers, he would have been accurate in his observation that “adjectival use was acceptable to those of Linnaeus’ own time.”

The judgments of Kunth and of Link, however, are still just judgments of later authors, no different from those of the many still later authors who chose *E. colona*. Only the action by the original author, Linnaeus, could potentially carry decisive weight.

It is unknown why Linnaeus (1759) chose “*colonum*” as the spelling of the epithet for his new species. He was, of course, assigning the new entity to the genus *Panicum*, a genus he had formed earlier (1753) and which he had treated

as neuter (as indicated both by the ending of the word (-um) and by the ending of adjectival epithets he placed thereunder). Since Linnaeus both wrote and spoke Latin (Stafleu 1971:83), he cannot be thought of as making a beginner's error, that is, he would have known full well that the nominative was *colonus* and that the word, carried into botanical usage, would normally retain its nominative spelling unchanged. Too, if he obtained his epithet from the brief usage by Plukenet (1692), he knew the word to be a noun. Yet his use of lower case for the initial letter of *colonom* indicates he thought of the word as formed differently from other substantives.

Two alternatives are offered. Perhaps Linnaeus did understand the word to be a noun and chose the accusative, or *colonom*, for reasons of euphony, for smooth combination with its assigned genus *Panicum*. Or perhaps Linnaeus chose to disregard its meaning as a noun and saw it only as a sequence of letters which could be treated as an adjective and declined to agree with its genus.

CONCLUSION

The second of these possibilities is untenable. One cannot break away from the certainty that Linnaeus would have recognized the word was a noun and must have intentionally chosen the accusative, *colonom*, so that it would follow smoothly his genus *Panicum*. His choice of *colonom* is within the practices of the 18th century and the language of the modern Code. His preference for the harmonious *colonom* rather than the discordant *colonus* in no way negates its status as a noun. His decapitalization of the initial letter is stylistic and immaterial. No argument seems convincing that Linnaeus thought of the word as an adjective. Though Linnaeus, by creating the new name, had the option of selecting for its epithet whatever word he wished, his choice of a word that is a noun removes the power of later authors to treat it as an adjective. As a noun whose spelling is unchanged in whatever genus it may be placed, the name formed by Link in 1833 must be read as *Echinochloa colonom*.

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